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## Ebola Virus Disease and Children: What Pediatric Health Care Professionals Need to Know

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The largest outbreak of Ebola virus disease (EVD) in history is occurring in West Africa. On August 8, 2014, the World Health Organization (WHO) declared this outbreak to be a Public Health Emergency of International Concern.<sup>1</sup> As of October 8, 2014, 8399 EVD cases (including 416 in health care personnel) with 4033 deaths were reported, although reported cases are likely a substantial underestimate of the outbreak magnitude.<sup>2</sup> Most EVD cases have been reported in Guinea, Liberia, and Sierra Leone, with fewer cases in Nigeria and a single case in Senegal. Although the suspected index case for this outbreak is believed to be a 2-year-old child who died in Guinea in December 2013, limited information is available on the impact of this outbreak on children.<sup>3</sup> Cases of EVD were also identified in the Democratic Republic of the Congo, but analyses of viruses suggest that the Democratic Republic of the Congo outbreak is not linked to the wider epidemic. As of October 15, 2014, 3 EVD cases, including 2 health care personnel, had been identified in the United States and 5 EVD cases, including 4 health care personnel, were identified in West Africa and medically evacuated to the United States for further care. This situation is rapidly evolving, and new information will be posted to the Centers for Disease Control and Prevention (CDC) (<http://www.cdc.gov/vhf/ebola/index.html>) and WHO (<http://www.who.int/mediacentre/factsheets/fs103/en/>) websites as it becomes available. Our report is intended to complement information on the CDC webpages, with a focus on what pediatric health care professionals need to know.

### BACKGROUND

Ebola virus disease is a rare zoonotic disease caused by infection with 1 of 5 species of *Ebolavirus*. *Zaire ebolavirus*, the species responsible for the current outbreak, was first discovered in 1976 near the Ebola River in Zaire (now the Democratic Republic of the Congo). Since then, a number of EVD outbreaks have been recognized, primarily confined to remote areas of East and Central Africa. The animal reservoir of *ebolavirus* is believed to be fruit bats. Zoonotic transmission can occur through direct contact with bats, primates, and duiker antelopes that have died from *ebolavirus* infection. *Ebolavirus* can spread among

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humans primarily through unprotected direct contact of skin (through breaks or microabrasions) or mucous membranes with blood or body fluids (eg, feces, saliva, urine, and vomit) of a person who is ill with EVD, or the corpse of a deceased patient who had EVD, or possibly with objects contaminated with the blood or body fluids of an infected person. The mean incubation period in the current outbreak is estimated at 11.4 days (typical range, 2–21 days).<sup>4,5</sup> A person with *ebolavirus* infection is not contagious until symptoms are present. Currently, no specific therapeutics or vaccines are approved for EVD, and clinical management is focused on supportive care of complications (eg, hypovolemia and electrolyte abnormalities). Several investigational therapeutics are in development and some may be available for compassionate use or through enrollment in clinical trials in the future. Two investigational EVD vaccines are in Phase I trials in healthy adults.

## WHAT IS KNOWN ABOUT EVD IN CHILDREN?

### Transmission of *Ebolavirus* to Children

Because EVD outbreaks have typically occurred in low-resource settings, detailed information about pediatric cases has not been systematically collected. Based on available data, children and adolescents often comprise a small percentage of EVD cases. For example, in an outbreak in Zaire in 1995 in which more than half of the population was younger than 18 years, only 9% of the 315 EVD cases were younger than 18 years.<sup>5</sup> Similarly, 147 of 823 (18%) reported EVD cases reported from the current outbreak in Guinea were children,<sup>6</sup> and 13.8% of cases from 4 affected countries were younger than 15 years.<sup>4</sup> Investigators have suggested that the low number of pediatric EVD cases may be owing to cultural practices in which children are kept away from sick family members, resulting in reduced *ebolavirus* transmission.<sup>4</sup>

### Manifestations of EVD in Children

A unique challenge facing pediatricians is being able to distinguish EVD signs and symptoms from features of much more common pediatric infectious diseases. Typically, children may present with nonspecific signs and symptoms of EVD similar to those in adults, which initially include fever, headache, myalgia, abdominal pain, and weakness, followed several days later by vomiting, diarrhea, and, less commonly, unexplained bleeding or bruising. However, data are very limited. This highlights the key issue of eliciting a history of exposure to *Zaire ebolavirus* including a travel history and especially any recent direct contact with the blood or bodily fluids of a person who was sick or died from suspected or confirmed *Zaire ebolavirus* infection.

In the 2000–2001 *Sudanebolavirus* outbreak in Uganda, all children with laboratory-confirmed EVD were febrile, while only 16% had hemorrhage.<sup>7</sup> Respiratory (eg, cough and dyspnea) and gastrointestinal symptoms were common among children, while central nervous system signs were rare.<sup>7</sup>

The overall case-fatality proportion in the current outbreak is estimated at 70.8%, including 73.4% in children younger than 15 years, 66.1% for those aged 15 to 44 years, and 80.4% for those older than 44 years.<sup>4</sup> However, in the *Sudanebolavirus* outbreak in Uganda during 2000–2001, children younger than 5 years were reported to be at increased risk for illness

and death.<sup>6</sup> The authors hypothesized that this was owing to more prolonged contact with ill caregivers (in this outbreak, young uninfected children were often admitted to EVD treatment unit isolation wards with their ill parents because of the reluctance of other adults to care for them).<sup>7</sup>

Given the impact of this EVD outbreak on the health care infrastructure in the most severely affected countries, the health of children is likely to be seriously impacted because of challenges to providing routine care (eg, immunizations and hospitalizations for common illnesses) in affected countries.

### Considerations for the Pediatric Health Care Professional

Pediatric health care professionals should have a high index of suspicion for EVD if the child has compatible signs and symptoms and a history of travel from an affected country within the past 21 days. It is essential that health care professionals take a detailed travel history. Malaria, measles, typhoid fever, and other infectious diseases are also endemic in West Africa and should be included in the differential diagnosis of a febrile pediatric traveler from West Africa. Information on high- and low-risk exposures and case definitions for the United States are available at <http://www.cdc.gov/vhf/ebola/hcp/case-definition.html>. If EVD is suspected, appropriate infection-control precautions (eg, standard, droplet, and contact) should be implemented immediately and the state health department should be promptly notified. The CDC developed an algorithm to evaluate travelers returning from areas with cases of EVD (<http://www.cdc.gov/vhf/ebola/pdf/ebola-algorithm.pdf>). Laboratory specimens should be processed according to CDC guidance (<http://www.cdc.gov/vhf/ebola/pdf/ebola-lab-guidance.pdf>).

## CONCLUSIONS

Health care professionals, including those who care for children, should be familiar with the clinical features of EVD and should inquire about recent travel to affected West African countries when assessing patients with compatible illness. Prompt implementation of recommended infection-control measures and appropriate reporting to state health departments are essential to prevent further transmission. Based on previous outbreaks and limited data from the current epidemic to date, children may be at lower risk for EVD than adults. Therefore, health care professionals should also consider other common infectious diseases prevalent in West Africa when evaluating ill children from this region, while maintaining a high level of suspicion for EVD.

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